

## CLAIMS

What is claimed is:

1. A centrifugal clutch assembly, comprising:

an input portion fixed for rotation with an input member and an output portion fixed for rotation with an output member, the output portion including at least one friction plate secured for rotation with the output member, the input portion including a cover module secured for rotation with the input member; and

wherein the cover module includes a pressure plate for applying a clamping force against the at least one friction plate, a moveable plate adapted to rotate with the cover module but axially displaceable with respect thereto to apply an axial force on the pressure plate, a fixed plate secured for rotation with the cover module and a plurality of weights positioned between the moveable plate and the fixed plate that are adapted to move outward under the effects of centrifugal force to cause axial movement in the moveable plate and the pressure plate to exert a clamping force on the friction plate, the cover module further including at least one return spring configured to apply a return force on the weights through the moveable plate, the return force being generally parallel to the axis of rotation of the cover module.

2. The centrifugal clutch assembly of claim 1, wherein the return spring is adapted to apply the return force on all of the weights.

3. The centrifugal clutch assembly of claim 1, wherein the return spring is positioned between the fixed plate and a reaction member connected to the moveable plate for movement therewith.

4. The centrifugal clutch assembly of claim 3, wherein the return spring and reaction member are adapted to apply the return force by pulling on the moveable plate.

5. The centrifugal clutch assembly of claim 3, wherein the return spring is a diaphragm spring.

6. The centrifugal clutch assembly of claim 5, wherein the diaphragm spring has a height to thickness ratio of approximately 1.5.
7. The centrifugal clutch assembly of claim 1, wherein the return spring is positioned between the fixed plate and a bolt connected to the movable plate.
8. The centrifugal clutch assembly of claim 7, wherein the return spring is a coil spring.
9. The centrifugal clutch assembly of claim 1, further including a plurality of return springs.
10. The centrifugal clutch assembly of claim 1, wherein the return force is independent of weight position.
11. The centrifugal clutch assembly of claim 1, wherein one of the movable plate and the fixed plate includes a plurality of ramps that are engaged by the weights.
12. The centrifugal clutch assembly of claim 11, wherein the ramps taper radially outwardly and away from the corresponding movable plate or fixed plate at an increasing angle.
13. The centrifugal clutch assembly of claim 11, wherein the ramps taper radially outwardly and away from the corresponding movable plate or fixed plate at an angle of about 7 degrees adjacent a radially innermost portion of the ramps to an angle of about 13 degrees adjacent a radially outermost portion of the ramps.
14. The centrifugal clutch assembly of claim 11, wherein the ramps include first and second ramp surfaces.
15. The centrifugal clutch assembly of claim 14, wherein the cover module is adapted to cause the return force imposed on the weights engaged with the first ramp surface to be transferred to the weights engaged with the second ramp surface during disengagement of the clutch.

16. The centrifugal clutch assembly of claim 14, wherein the first and second ramp surfaces taper radially outwardly and away from the corresponding movable plate or fixed plate at different angles.

17. The centrifugal clutch assembly of claim 14, wherein the first ramp surface tapers radially outwardly and away from the corresponding movable plate or fixed plate at an increasing angle.

18. The centrifugal clutch assembly of claim 14, wherein the first ramp surface tapers radially outwardly and away from the corresponding movable plate or fixed plate at an angle of about 10.5 degrees adjacent a radially innermost portion of the first ramp surface to an angle of about 14 degrees adjacent a radially outermost portion of the first ramp surface.

19. The centrifugal clutch assembly of claim 14, wherein the second ramp surface tapers radially outwardly and away from the corresponding movable plate or fixed plate at an angle of about 5 degrees.

20. The centrifugal clutch assembly of claim 1, wherein each of the weights is a roller weight that includes a shaft-like inner roller portion, a generally cylindrical outer roller portion and a bearing positioned between the inner and outer roller portions.

21. The centrifugal clutch assembly of claim 1, wherein the moveable plate is adapted to apply an axial force on the pressure plate through a preloaded plate spring that limits the axial force applied to the pressure plate by the movable plate.

22. A centrifugal clutch assembly for a vehicular drivetrain system, comprising:

an input portion fixed for rotation with an engine flywheel and an output portion fixed for rotation with a transmission input shaft, the output portion including at least one friction plate secured to the transmission input shaft for rotation therewith, the input portion including a cover module secured to the engine flywheel for rotation therewith; and

wherein the cover module includes an axial moveable pressure plate for applying a clamping force against the at least one friction plate, a ramp plate and a reaction plate, wherein one of the ramp plate and that reaction plate is adapted to rotate with the cover module but is axially displaceable with respect thereto to apply a force on the axially movable pressure plate, the other of the ramp plate and the reaction plate being fixed for rotation with the cover module, the cover module further including a plurality of roller weights positioned between the ramp plate and the reaction plate that are adapted to move outward under the effects of centrifugal force to cause axial movement in the moveable ramp plate or the moveable reaction plate and the pressure plate to exert a clamping force against the friction plate, the ramp plate including a plurality of ramps that taper radially outwardly and away from the ramp plate at an increasing angle with respect to the ramp plate, the cover module further including a return spring member configured to apply a return force against the moveable ramp plate or the movable reaction plate to bias each of the roller weights toward a pre-moved position.

23. The centrifugal clutch assembly of claim 22, wherein the return spring member is a diaphragm spring.

24. The centrifugal clutch assembly of claim 22, wherein the return spring member is a coil spring.

25. The centrifugal clutch assembly of claim 22, wherein the ramps taper radially outwardly and away from the ramp plate at an angle of about 7 degrees adjacent a radially innermost portion of the ramps to an angle of about 13 degrees adjacent a radially outermost portion of the ramps.

26. The centrifugal clutch assembly of claim 22, wherein the ramps include first and second ramp surfaces.

27. The centrifugal clutch assembly of claim 26, wherein the first and second ramp surfaces taper radially outwardly and away from the ramp plate at different angles with respect to the ramp plate.

28. The centrifugal clutch assembly of claim 26, wherein the first ramp surface tapers radially outwardly and away from the ramp plate at an increasing angle with respect to the ramp plate.

29. The centrifugal clutch assembly of claim 26, wherein the first ramp surface tapers radially outwardly and away from the ramp plate at an angle of about 10.5 degrees adjacent a radially innermost portion of the first ramp surface to an angle of about 14 degrees adjacent a radially outermost portion of the first ramp surface.

30. The centrifugal clutch assembly of claim 26, wherein the second ramp surface tapers radially outwardly and away from the ramp plate at an angle of about 5 degrees relative to the ramp plate.

31. The centrifugal clutch assembly of claim 22, wherein each of the roller weights includes a shaft-like inner roller portion, a generally cylindrical outer roller portion and a bearing positioned between the inner and outer roller portions.

32. The centrifugal clutch assembly of claim 31, wherein the ramps are engaged with one of the inner and outer roller portions.

33. The centrifugal clutch assembly of claim 22, wherein the moveable plate is adapted to apply an axial force on the pressure plate through a preloaded plate spring member that limits the axial force applied to the pressure plate by the movable plate.

34. A centrifugal clutch assembly for a vehicular drivetrain system, comprising:

an input portion fixed for rotation with an engine flywheel and an output portion fixed for rotation with a transmission input shaft, the output portion including at least one friction plate secured to the transmission input shaft for rotation therewith, the input portion including a cover module secured to the engine flywheel for rotation therewith; and

wherein the cover module includes an axial moveable pressure plate for applying a clamping force against the at least one friction plate, a first weight engaging plate adapted to rotate with the cover module but axially displaceable with

respect thereto to apply a force on the axially movable pressure plate, a second weight engaging plate fixed for rotation with the cover module, and a plurality of roller weights positioned between the first weight engaging plate and the second weight engaging plate that are adapted to move outward under the effects of centrifugal force to cause axial movement in the first weight engaging plate and the pressure plate to exert a clamping force against the friction plate, the cover module further including a reaction member engaged for axial movement with the first weight engaging plate and at least one return spring member positioned between the reaction member and the second weight engaging plate, the return spring member configured to apply a return force against the first weight engaging plate through the reaction member to bias each of the roller weights toward a pre-moved position against the effects of centrifugal force.

35. The centrifugal clutch assembly of claim 34, wherein the return spring member is one of a coil spring and a diaphragm spring.

36. The centrifugal clutch assembly of claim 34, wherein the return spring member has a height to thickness ratio of approximately 1.5.

37. The centrifugal clutch assembly of claim 34, wherein one of the first and second weight engaging plates includes a plurality of ramps that are engaged by the roller weights.

38. The centrifugal clutch assembly of claim 37, wherein the ramps taper radially outwardly and away from the corresponding weight engaging plate at an increasing angle.

39. The centrifugal clutch assembly of claim 37, wherein the ramps taper radially outwardly and away from the corresponding weight engaging plate at an angle of about 7 degrees adjacent a radially innermost portion of the ramps to an angle of about 13 degrees adjacent a radially outermost portion of the ramps.

40. The centrifugal clutch assembly of claim 37, wherein the ramps include first and second ramp surfaces.

41. The centrifugal clutch assembly of claim 40, wherein the first and second ramp surfaces taper radially outwardly and away from the corresponding weight engaging plate at different angles.
42. The centrifugal clutch assembly of claim 40, wherein the first ramp surface tapers radially outwardly and away from the corresponding weight engaging plate at an increasing angle.
43. The centrifugal clutch assembly of claim 40, wherein the first ramp surface tapers radially outwardly and away from the corresponding weight engaging plate at an angle of about 10.5 degrees adjacent a radially innermost portion of the first ramp surface to an angle of about 14 degrees adjacent a radially outermost portion of the first ramp surface.
44. The centrifugal clutch assembly of claim 40, wherein the second ramp surface tapers radially outwardly and away from the corresponding weight engaging plate at an angle of about 5 degrees relative to the corresponding weight engaging plate.
45. The centrifugal clutch assembly of claim 34, wherein each of the roller weights includes a shaft-like inner roller portion, a generally cylindrical outer roller portion and a bearing positioned between the inner and outer roller portions.
46. The centrifugal clutch assembly of claim 45, wherein the ramps are engaged with one of the inner and outer roller portions.
47. The centrifugal clutch assembly of claim 34, wherein the reaction member is one of a sleeve and a bolt.
48. The centrifugal clutch assembly of claim 34, wherein the first weight engaging plate is adapted to apply an axial force on the pressure plate through a preloaded plate spring that limits the axial force applied to the pressure plate by the first weight engaging plate.